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FORM PTO-1390 (REV. 9-2001)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 60130-1371	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	
				10/089030	
INTERNATIONAL APPLICATION NO. PCT/EP00/09526		INTERNATIONAL FILING DATE September 28, 2000		PRIORITY DATE CLAIMED September 28, 1999	
TITLE OF INVENTION VEHICLE DOOR					
APPLICANT(S) FOR DO/EO/US Rainer Grimm, et al.					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</p> <p>4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> has been communicated by the International Bureau.</p> <p style="margin-left: 20px;">c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> is attached hereto.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> have been communicated by the International Bureau.</p> <p style="margin-left: 20px;">c. <input checked="" type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p style="margin-left: 20px;">d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).</p> <p>9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> <p>Items 11 to 20 below concern document(s) or information included:</p> <p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.</p> <p>14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>15. <input type="checkbox"/> A substitute specification.</p> <p>16. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</p> <p>18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</p> <p>19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</p> <p>20. <input checked="" type="checkbox"/> Other items or information: Certificate of Mailing EL 747 232 219 US</p>					

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U.S. APPLICATION NO. (if known) 37 CFR 1.51 10/089030		INTERNATIONAL APPLICATION NO. PCT/EP00/09526		ATTORNEY'S DOCKET NUMBER 60130-1371	
21. <input type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1040.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS PTO USE ONLY	
				\$ 1040.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	12 - 20 =	0	x \$18.00	\$	
Independent claims	1 - 3 =	0	x \$84.00	\$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$280.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$ 1040.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$	
SUBTOTAL =				\$ 1040.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 1040.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
TOTAL FEES ENCLOSED =				\$ 1040.00	
				Amount to be refunded:	\$
				charged:	\$ 1040.00
a. <input checked="" type="checkbox"/> A check in the amount of \$ 1040.00 to cover the above fees is enclosed.					
b. <input type="checkbox"/> Please charge my Deposit Account No. 50-1482 in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 50-1482 . A duplicate copy of this sheet is enclosed.					
d. <input type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO:					
026096 Carlson, Gaskey & Olds, P.C. 400 W. Maple Suite 350 Birmingham, MI 48009 (248) 988-8360					
				SIGNATURE Karin H. Butchko	
				NAME 45,864	
				REGISTRATION NUMBER	
Dated:				March 26, 2002	

60130-1371
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Rainer Grimm, et al.
Serial No.: Unknown
Filed: Herewith
Priority: PCT/EP00/09526 Filed: September 28, 2000
DE 199 46 307.7 Filed: September 28, 1999
DE 199 46 311.5 Filed: September 28, 1999
DE 200 10 204.4 Filed: June 9, 2000
Group Art Unit: Unknown
Examiner: Unknown
Title: VEHICLE DOOR

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner of Patents
Washington, D.C. 20231

Dear Sir:

Please amend the application in the following particulars prior to Examination.

IN THE SPECIFICATION:

Page 1, after the title and above line 1, please insert the following section heading:

BACKGROUND OF THE INVENTION

Amended page 2, line 7, please insert the following section heading:

SUMMARY OF THE INVENTION

Inasmuch as the term “U-shaped-structure” is used, this means, in the sense of the invention, that this structure forms at least part of a frame structure 10 and a profile bar 10A is part of said U-shaped-structure at least at one of its sides. Said U-shaped-structure maybe completed to form a complete loop necessary. The U-shape may open toward any edge of the door but preferably opens to the top. The open edge maybe closed by a further profile bar or element, e.g. stamping, to form a completed loop. Said U-shaped-structure maybe formed in different ways, particularly by bending a profile bar into a U-shaped form; however, the legs of the U-shape maybe connected together by a multiplicity of other elements (instead of a bended curve element), e.g. by other or same profiles, other stampings or moldings or die-castings, with appropriate fixings in the corner areas as required. The oblong profile used for the U-shaped-structure may also be discontinuous, particularly in the vicinity of the motor of a window-regulator or maybe jointed by one or several other elements which form the discontinuity, e.g. a separate mounting plate, molding or die-casting fitted, which may join discontinuous parts of the profiles together.

BRIEF DESCRIPTION OF THE DRAWINGS

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

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Please insert the following paragraph at the end of page 13:

The foregoing description is only exemplary of the principles of the invention. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, so that one of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specially described. For that reason the following claims should be studied to determine the true scope and content of this invention.

Please delete the text on page 14.

Page 15, before the first claim, please insert the section heading:

Please delete claims 1-11.

12. (NEW) A vehicle door comprising:
an interior shell and an exterior shell defining an interior space, and a frame structure which forms a U-shaped structure provided with at least one guide element for a window regulator arrangement, wherein said U-shaped structure is made from a profile bar which supports and reinforces said vehicle door.

14. (NEW) The vehicle door, in accordance with claim 13, wherein said window regulator arrangement includes drive cables which are received in said guide elements and extend from said motor to a window pane.

16. (NEW) The vehicle door, in accordance with claim 15, wherein said coupling members are glued to said window pane.

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IN THE ABSTRACT:

Please replace the abstract as follows:


A vehicle door, consisting of an interior shell and a respective exterior shell defining an interior space of a door on both sides and further contains a frame structure, the lateral surfaces of the frame structure are covered by at least one of the interior shell and the respective exterior shell. In order to make this vehicle door comparatively lightweight but rigid while using parts of a window-regulator as structural parts of the vehicle door the frame structure consists at least in part of a profile bar, bent into a U-shape as viewed from the side and opening to the top of the vehicle door. Said profile bar is provided with guide elements for a window-regulator arrangement.

REMARKS

Applicant respectfully requests examination of this application.

Respectfully submitted,

CARLSON, GASKEY & OLDS, P.C.



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Registration No. 45,864
Attorneys for Applicant
400 West Maple Road, Suite 350
Birmingham, Michigan 48009
(248) 988-8360

Dated: March 26, 2002

Page 1, after the title and above line 1, please insert the following section heading:

Amended page 2, line 7, please insert the following section heading:

Amended page 4 and page 5, please amend the paragraph bridging these pages as follows:

Inasmuch as the term “U-shaped-structure” is used, this means, in the sense of the invention, that this structure forms at least part of a frame structure 10 and a profile bar 10A is part of said U-shaped-structure at least at one of its sides. Said U-shaped-structure maybe completed to form a complete loop necessary. The U-shape may open toward any edge of the door but preferably opens to the top. The open edge maybe closed by a further profile bar or element, e.g. stamping, to form a completed loop. Said U-shaped-structure maybe formed in different ways, particularly by bending a profile bar into a U-shaped form; however, [he] the legs of the U-shape maybe connected together by a multiplicity of other elements (instead of a bended curve element), e.g. by other or same profiles, other stampings or moldings or die-castings, with appropriate fixings in the corner areas as required. The oblong profile used for the U-shaped-structure may also be discontinuous, particularly in the vicinity of the motor of a window-regulator or maybe jointed by one or several other elements which form the disconuity, e.g. a separate mounting plate, molding or die-casting fitted, which may joy discontinuous parts of the profiles together.

Page 5, line 14, please insert the following section heading:

BRIEF DESCRIPTION OF THE DRAWINGS

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Such a profile, as well as the profiles according to Figures 3 and 5, may have, at least partially, viewing surfaces in the vehicle door, so that a complete or partial profile trim panel can be omitted, which may be advantageous, particularly for the upper part of the frame serving as a window panel guide frame in the examples of a vehicle door shown in Figures 1A[,] and 6 [and 7], since side coverings of the frame structure as such are not absolutely necessary in this area.

In the embodiments according to Figures 3 and 5, it is possible to align the exterior surface of a window pane 22 with an exterior surface of the profile 10A, so that between the window pane 22 and the window frame 10, steps can be avoided which are disruptive visually and/or with respect to air flow. In the example according to Figure 5, the window pane 22 has toward the interior side a large contact surface with respect to the profile 10A which, not expressly shown in the drawing, can be used as a sealing surface; for example, for accommodating a sealing profile. A visually very advantageous window coupling with a pressure/traction element 20 is achieved in this example by means of a coupling member 24 which grips from outside through a slotted area of the guide element 16 into the profile 10A and there is connected with the pressure/traction element 20. An angular area of the coupling member 234, extending out of the guide element 16 parallel to the window 22, makes possible its connection with the window; for example, by gluing. Such a coupling member may be very short in the direction of movement, in particular, several such coupling members may be provided along the guide element 16. Advantages with respect to stability, however, are also possibly brought about by an oblong coupling member, extending along the guide element 16, which member is connected with the window pane 22 along a greater or even the entire length of the guide element of the window.

ABSTRACT

A vehicle door, consisting of an interior shell and a respective exterior shell defining an interior space of a door on both sides and further contains a frame structure [(10)], the lateral surfaces of the frame structure [(10)] are covered by at least one of the interior shell and the respective exterior shell. In order to make this vehicle door comparatively lightweight but rigid while using parts of a window-regulator as structural parts of the vehicle door the frame structure consists at least in part of a profile bar [(10A)], bent into a U-shape as viewed from the side and opening to the top of the vehicle door. Said profile bar [(10A)] is provided with guide elements for a window-regulator arrangement.

Claims

1. Vehicle door, consisting of an interior shell (12) and a respective exterior shell (14) defining an interior space (26) of a door and further contains a frame structure (10); the lateral surfaces of the frame structure (10) are covered by at least one of the interior shell (12) and the respective exterior shell (14), characterized in that the frame structure (10) contains a profile bar (10A), forming at least part of a U-shaped structure as viewed from the side and opening towards an outer edge of the vehicle door^x and that said profile bar (10A) is provided with *both* of the guide elements (16) for a window-regulator arrangement.
2. Vehicle door, in accordance with Claim 1, characterized in that said U-shaped structure is provided with a window-operating motor (18) or another window drive or adapted to receive such motor or drive.
3. Vehicle door, in accordance with Claim 2, characterized in that in the guide elements (16), drive cables, especially pressure and traction elements (20) of the window-regulator arrangement are integrated; said profile bar (10A) joins said motor or drive to a window pane (22) via said profile bar.
4. Vehicle door, in accordance with anyone of the Claims 1 to 3, characterized in that a raisable/lowerable window pane (22) is provided with coupling members (24) gripping into the guide elements (16).
5. Vehicle door, in accordance with Claim 4, characterized in that the coupling member (24) is glued to a window pane (22) of the door.
- x) , said U-shaped structure taking on at least a substantial part of the support and reinforcement function of the vehicle door,*

① < For another vehicle door, the US-A- 5,907,897 discloses a conventional main door body made from inner and outer sheet metals connected by hemming to form a box with an upper slid for receiving the window panel together with the whole panel guide frame. Said box continues to take nearly the whole support and reinforcement function of said vehicle door. >
mounting of such a vehicle door expensive and increases the weight of the vehicle door.] < ① >

5 Based thereon, it is the problem of the invention to create a comparatively lightweight vehicle door from functionally suitable component parts. The number of structural components is to be reduced, if possible.

10 As a solution to this problem, a vehicle door with the characteristic of Claim 1 is proposed. Such a vehicle door has a frame structure which is covered at least on one of its sides with an inner or outer shell respectively, particularly panel elements; said frame structure consists at least in part of a profile bar, which forms at least part of a U-shaped structure as viewed from the side, for instance by bending said profile bar, and which U-shape opens towards an outer edge of the vehicle door, particularly to its top. Thereby, the U-shaped
15 structure may take on at least a substantial part of the support and reinforcement function of the vehicle door. It may be closed to form a complete loop as well.

20 However the U-shaped structure does not only provide a high degree of stability, especially rigidity, of the vehicle door, for instance in the threshold area located at the lower edge of the door as well as its vertical and preferably parallel lateral extensions where it can accommodate the forces of the door hinges and of the door lock. The U-shaped structure - also - accommodates or even replaces essential components of a window opener arrangement -
25 hereinafter called a window-regulator arrangement.

In a first embodiment, the two profile portions of an upright U extend approximately parallel and provide guide elements for a window-regulator arrangement, so that known slide elements can be completely omitted.
30 Preferably, the U-shaped structure also accommodates a window-regulator drive; in particular, an electric motor. Furthermore, it can serve as guide

Furthermore, such a vehicle door simplifies the structural type and the mounting of important functional parts, such as window-regulator arrangements, door hinges and door lock, wherein the frame structure is in a better position than the known metal sheets ^{< ② >} of doors to carry out a dual function, thereby saving on structural components, weight and/or mounting costs.

② < (like known from US-A-5,907,897, mentioned above) >

Inasmuch as the term "frame structure" is used, this means, in the sense of the invention, that struts or strut-like structural components, leaving between them free spaces or openings, are connected with each other. The "oblong profiles," from which the frame structure formed, may be struts stamped from a plate, such as a metal sheet, and possibly additionally formed by a deep-drawing process; the struts being interconnected. The "oblong profiles" may be as well rods, at first in straight form and produced, for example, in an extrusion or continuous casting process, which are reshaped and/or joined by bending and/or by being connected with each other to form the desired frame structure. Such profiles, produced in the extrusion or continuous casting process, are also suited as frame elements for the vehicle door when they are provided as a support structure, especially in the A-, B- and/or C-column of the vehicle body, at least at one side of the vehicle door.

Inasmuch as the term "U-shaped-structure" is used, this means, in the sense of the invention, that this structure forms at least part of a frame structure 10 and a profile bar 10A is part of said U-shaped-structure at least at one of its sides. Said U-shaped-structure maybe completed to form a complete loop necessary. The U-shape may open toward any edge of the door but preferably opens to the top. The open edge maybe closed by a further profile bar or element, e.g. stamping, to form a completed loop. Said U-shaped-structure maybe formed in different ways, particularly by bending a profile bar into a U-shaped form; however, the legs of the U-shape maybe connected together by a multiplicity of

Figure 2 shows part of an U-shaped element for a frame structure, according to Figure 1A, with an alternative profile cross section in perspective view;

5 Figure 3 shows an alternative cross sectional form of an oblong profile with window-regulator guide element in cross section;

Figure 4 shows an alternative profile cross section with window guide element;

10 Figure 5 shows an additional alternative profile cross section with window guide element;

Figure 6 shows a vehicle door in schematic side view with a window-regulator drive;

15 ~~Figure 7 shows an alternative embodiment of a vehicle door in schematic side view with a window regulator drive and~~

20 Figure 8 shows an alternative embodiment of a frame structure with window guide element in horizontal cross section.

25 From Figures 1A to 1C, the three main components of a vehicle door in accordance with the invention can be gathered, namely a frame structure 10 (Figure 1A), formed from oblong profiles 10A to 10D, an external view of an interior shell or trim panel 12 (Figure 1B), wherein the interior shell covers the lateral surface of the frame structure 10 visible in Figure 1A, as well as an interior view of an exterior shell 14 (Figure 1C), wherein the exterior shell covers the lateral surface opposite the lateral surface visible in Figure 1A. A horizontal cross section along the line ID-ID in the lower area of the door can be seen in Figure 1D (profile 10B being deleted for clarity reasons).

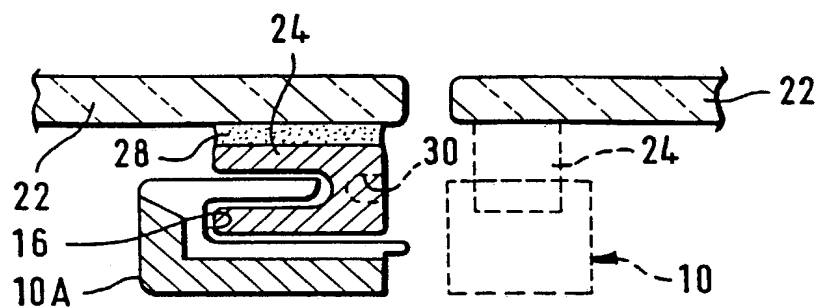
30

The frame structure 10, shown in Figure 1A, consists of a total of four profile sections 10A to 10D, produced in an extrusion process, with the cross section visible in Figure 2. The main component is a U-shaped profile bar 10A, formed by bending, which has parallel, approximately vertically extending lateral extensions and an approximately horizontally extending base extension and wherein a groove 16A surrounding a window-regulator guide element 16, visible in Figure 2, opens toward the interior curvature of the U-shape. The profile sections 10B to 10D, extending essentially diagonally, i.e. horizontally to diagonally, serve to reinforce the frame structure formed in the core of the U-shaped structural component 10A. They are connected with the U-shaped rod 10A in a rigid angle manner, for example, by welding or by any other known method.

(other than in the US-A-5,907,897 as mentioned above)

As a whole, the frame structure 10 represents the structural components determining the strength and the rigidity of the vehicle door. Therefore, it is possible to make relatively small demands regarding material selection and the strength of the interior shell 12 and the exterior shell 14. With respect to rigidity, they basically need only meet the requirements of the main function, which is to close off the interior space 26 of the door in an especially sealing manner and they must satisfy the requirements regarding the resistance to deformation and fatigue durability with respect to typical lateral stresses from the interior side of the vehicle or the exterior side of the vehicle.

While in the example according to Figures 1A to 2 the interior shell 12 already serves as an interior or trim panel of the vehicle door which, for example, is produced from a suitable non-metal, the interior covering of the frame structure 10 may, for example, also consist of a deep-drawn, so-called interior metal plate whose strength suffices for accommodating heavier or more greatly stressed functional components, particularly to serve as a pre-fabricated support module for a multitude of functional components, wherein an additional interior or trim panel satisfies the visual expectations and those regarding the



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Vehicle door

The invention relates to a vehicle door consisting of an interior shell and an outer shell adjacent to both sides of an interior door space.

5 With known vehicle doors of this type, the interior shell and the exterior shell consist of deep-drawn parts of metal sheet (interior metal sheet and exterior metal sheet) which are connected with each other along the edge; for example, by folding the exterior metal sheet around the edge of the interior metal sheet. While the outer metal sheet is primarily manufactured in accordance with a visual point of view, such as shape and color, the interior metal sheet has the

10 function of a support structure which is connected via hinges and a lock with a door frame of the vehicle and furthermore contains functional parts of the vehicle door, such as a window-regulator arrangement, a speaker, airbag and the like. Thus, the interior metal sheet has to serve a multitude of functions which, in part, require conflicting measures. Therefore, the attachment of a

15 multitude of component parts to the interior metal sheet is inescapable, wherein the component parts take over a part of the door functions, such as guide rails of a window-regulator arrangement which makes possible the up and down movement of the transport slide element of a window which can be raised and lowered. The multitude of required component parts makes the

mounting of such a vehicle door expensive and increases the weight of the vehicle door.

5 Based thereon, it is the problem of the invention to create a comparatively lightweight vehicle door from functionally suitable component parts. The number of structural components is to be reduced, if possible.

10 As a solution to this problem, a vehicle door with the characteristic of Claim 1 is proposed. Such a vehicle door has a frame structure which is covered at least on one of its sides with an inner or outer shell respectively, particularly panel elements; said frame structure consists at least in part of a profile bar, which forms at least part of a U-shaped structure as viewed from the side, for instance by bending said profile bar, and which U-shape opens towards an outer edge of the vehicle door, particularly to its top. Thereby, the U-shaped
15 structure may take on at least a substantial part of the support and reinforcement function of the vehicle door. It may be closed to form a complete loop as well.

20 However the U-shaped structure does not only provide a high degree of stability, especially rigidity, of the vehicle door, for instance in the threshold area located at the lower edge of the door as well as its vertical and preferably parallel lateral extensions where it can accommodate the forces of the door hinges and of the door lock. The U-shaped structure - also - accommodates or even replaces essential components of a window opener arrangement -
25 hereinafter called a window-regulator arrangement.

In a first embodiment, the two profile portions of an upright U extend approximately parallel and provide guide elements for a window-regulator arrangement, so that known slide elements can be completely omitted.
30 Preferably, the U-shaped structure also accommodates a window-regulator drive; in particular, an electric motor. Furthermore, it can serve as guide

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element for driving elements of the window-regulator, such as flexible pressure- and traction means, particularly for the raising and lowering of the window and, in this way, replace the function of Bowden wires, or form tubes in which drive cables are led from the motor to the guide elements of the window regulator. Thus, such a frame structure becomes multifunctional and by saving on structural components makes possible a reduction in the weight of the vehicle door.

A particularly elegant mounting and guide element of a vehicle window which can be raised and lowered, having a favorable influence on the C_w -value of the vehicle, is achieved by coupling members which connect the window with the window guide element provided on the U-shaped profile bar. With such coupling members it is, for example, possible to freely select the position of the window with respect to the exterior panel of the vehicle door; in particular, to shift the position of the window pane relatively far toward the exterior of the vehicle door. By gluing the coupling members onto the interior side of the window, particularly in the area of the edge of such a window edge molded or sprayed with a suitable synthetic material, such as polyurethane, the window guide grooves can be omitted. Coupling members, in accordance with the invention, may also be in the form of straight profile rails which grip into the guide elements provided on the frame structure, particularly in a manner corresponding to their shape.

Furthermore, coupling members of the invention may also be adjustable besides being rigid, so that the position of the window with respect to the guide rails provided on the frame structure can be changed, particularly in a lateral direction. In this way, the window pane can be transported in the closed state into a plane aligned with the outer skin of the door. In order to open the window, the same is moved laterally out of its plane in the closed state in order to subsequently be lowered completely or partially into the interior of the door. Such a window-regulator arrangement is of independent inventive significance.

Furthermore, such a vehicle door simplifies the structural type and the mounting of important functional parts, such as window-regulator arrangements, door hinges and door lock, wherein the frame structure is in a better position than the known metal sheets of doors to carry out a dual function, thereby saving on structural components, weight and/or mounting costs.

Inasmuch as the term "frame structure" is used, this means, in the sense of the invention, that struts or strut-like structural components, leaving between them free spaces or openings, are connected with each other. The "oblong profiles," from which the frame structure formed, may be struts stamped from a plate, such as a metal sheet, and possibly additionally formed by a deep-drawing process; the struts being interconnected. The "oblong profiles" may be as well rods, at first in straight form and produced, for example, in an extrusion or continuous casting process, which are reshaped and/or joined by bending and/or by being connected with each other to form the desired frame structure. Such profiles, produced in the extrusion or continuous casting process, are also suited as frame elements for the vehicle door when they are provided as a support structure, especially in the A-, B- and/or C-column of the vehicle body, at least at one side of the vehicle door.

Inasmuch as the term "U-shaped-structure" is used, this means, in the sense of the invention, that this structure forms at least part of a frame structure 10 and a profile bar 10A is part of said U-shaped-structure at least at one of its sides. Said U-shaped-structure maybe completed to form a complete loop necessary. The U-shape may open toward any edge of the door but preferably opens to the top. The open edge maybe closed by a further profile bar or element, e.g. stamping, to form a completed loop. Said U-shaped-structure maybe formed in different ways, particularly by bending a profile bar into a U-shaped form; however, the legs of the U-shape maybe connected together by a multiplicity of

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Figure 1B

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- Figure 2 shows part of an U-shaped element for a frame structure, according to Figure 1A, with an alternative profile cross section in perspective view;
- 5 Figure 3 shows an alternative cross sectional form of an oblong profile with window-regulator guide element in cross section;
- Figure 4 shows an alternative profile cross section with window guide element;
- 10 Figure 5 shows an additional alternative profile cross section with window guide element;
- Figure 6 shows a vehicle door in schematic side view with a window-regulator drive;
- 15 Figure 7 shows an alternative embodiment of a vehicle door in schematic side view with a window-regulator drive and
- Figure 8 shows an alternative embodiment of a frame structure with window guide element in horizontal cross section.
- 20

From Figures 1A to 1C, the three main components of a vehicle door in accordance with the invention can be gathered, namely a frame structure 10 (Figure 1A), formed from oblong profiles 10A to 10D, an external view of an interior shell or trim panel 12 (Figure 1B), wherein the interior shell covers the lateral surface of the frame structure 10 visible in Figure 1A, as well as an interior view of an exterior shell 14 (Figure 1C), wherein the exterior shell covers the lateral surface opposite the lateral surface visible in Figure 1A. A horizontal cross section along the line ID-ID in the lower area of the door can be seen in Figure 1D (profile 10B being deleted for clarity reasons).

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The frame structure 10, shown in Figure 1A, consists of a total of four profile sections 10A to 10D, produced in an extrusion process, with the cross section visible in Figure 2. The main component is a U-shaped profile bar 10A, formed by bending, which has parallel, approximately vertically extending lateral extensions and an approximately horizontally extending base extension and wherein a groove 16A surrounding a window-regulator guide element 16, visible in Figure 2, opens toward the interior curvature of the U-shape. The profile sections 10B to 10D, extending essentially diagonally, i.e. horizontally to diagonally, serve to reinforce the frame structure formed in the core of the U-shaped structural component 10A. They are connected with the U-shaped rod 10A in a rigid angle manner, for example, by welding or by any other known method.

As a whole, the frame structure 10 represents the structural components determining the strength and the rigidity of the vehicle door. Therefore, it is possible to make relatively small demands regarding material selection and the strength of the interior shell 12 and the exterior shell 14. With respect to rigidity, they basically need only meet the requirements of the main function, which is to close off the interior space 26 of the door in an especially sealing manner and they must satisfy the requirements regarding the resistance to deformation and fatigue durability with respect to typical lateral stresses from the interior side of the vehicle or the exterior side of the vehicle.

While in the example according to Figures 1A to 2 the interior shell 12 already serves as an interior or trim panel of the vehicle door which, for example, is produced from a suitable non-metal, the interior covering of the frame structure 10 may, for example, also consist of a deep-drawn, so-called interior metal plate whose strength suffices for accommodating heavier or more greatly stressed functional components, particularly to serve as a pre-fabricated support module for a multitude of functional components, wherein an additional interior or trim panel satisfies the visual expectations and those regarding the

interior design. Naturally, such a support module, if a suitable material is selected, may also consist of a non-metal. On the other hand, it is possible to use the frame structure 10 in such a way, that functional components, such as an airbag, speaker, outside mirror and the like are connected to the frame structure itself, so that the interior shell 12 has more of a panel function than a support function. Other functional components, in particular the door hinges, are mounted as a rule only to the frame structure 10 in order to achieve an advantageous frictional connection.

10 The exterior shell 14, which may consist of metal sheet, a synthetic material or other suitable exterior panel material, will accommodate as a rule no functional components or only those which are subjected to little mechanical stress. At the same time, it is possible, for example, to provide lateral impact protection as a component of the exterior shell 14 on the latter's inside instead of
15 integrating it in the frame structure 10A.

Such a vehicle door, while having a high degree of strength, may be manufactured having a comparatively light weight, particularly with a frame structure of aluminum or another light metal or of carbon fibers or other very strong but light weight materials. The same oblong profiles, from which the frame structure 10 is formed, wherein also varying profile cross sections are possible for the individual frame structure components, may, depending on the layout, also form the exterior frame, i.e., the frame of the vehicle door which is fixed to the body of the automobile, particularly the support columns (A-, B- and/or C-column), provided laterally with respect to the vehicle door or may
20 form their supporting basic structure, thereby reducing the multitude of vehicle door components.

The other aspect of the vehicle door, in accordance with Figures 1A to 2, is the integration of a window-regulator arrangement for a window pane 22 which can
30 be raised and lowered into the frame structure 10. In the preferred embodiment

according to Fig. 2, an electrically driven version is used: the window-regulator motor 18 is supported by the approximately horizontal U-extension of the U-shaped structure 10A and is tightly connected with it, for example, by screws, and is possibly in part introduced into the profile 10A. Drive cables serving as pressure/traction elements 20 for the raising and lowering of the window pane extend from the window-regulator drive motor 18 through the window-regulator guide elements 16, formed in the profile 10A, which may be adapted to the cross section of the drive cable.

5 While Figure 1A provides only a single window-regulator guide element 16 in central arrangement, in the cross sectional variation according to Figure 2, two such window-regulator guide elements are provided, so that the pressure/traction element for each window side is guided along its entire length, respectively, and is kept in the profile 10A, - not only the section of the drive cable extending from the motor 18 to the window 22, but also the drive cable section extending out of the respectively opposite motor side which, while the window is lowered, is long and when the window is raised, is short to the point of having completely disappeared. These or other, possibly additional guide grooves may, as a replacement for Bowden wire tubes, also serve for other functional parts of the vehicle door.

20 Such a window-regulator arrangement integrates the function of the movement and the guidance of the window 22 into the frame structure 10, wherein the actual window pane may be connected via coupling members 24 with the drive elements, especially with the pressure/traction element 20, as is indicated in Figure 1D. These and similar window-regulator arrangements can also be gathered from the subsequently described Figures 3 to 8.

25 Figures 3 to 5 present additional alternatives to Figures 1D and 2 for the profile cross section design of the U-shaped profile bar of a frame structure 10 having the guide elements 16. In the example according to Figure 4, an edge guide

element 16B of the window 22 is already integrated in the profile 10A. For this reason, the window can also be guided directly by the profile 10A.

5 Such a profile, as well as the profiles according to Figures 3 and 5, may have, at least partially, viewing surfaces in the vehicle door, so that a complete or partial profile trim panel can be omitted, which may be advantageous, particularly for the upper part of the frame serving as a window panel guide frame in the examples of a vehicle door shown in Figures 1A, 6 and 7, since side coverings of the frame structure as such are not absolutely necessary in
10 this area.

In the embodiments according to Figures 3 and 5, it is possible to align the exterior surface of a window pane 22 with an exterior surface of the profile 10A, so that between the window pane and the window frame, steps can be avoided which are disruptive visually and/or with respect to air flow. In the example
15 according to Figure 5, the window pane 22 has toward the interior side a large contact surface with respect to the profile 10A which, not expressly shown in the drawing, can be used as a sealing surface; for example, for accommodating a sealing profile. A visually very advantageous window coupling with a
20 pressure/traction element 20 is achieved in this example by means of a coupling member 24 which grips from outside through a slotted area of the guide element 16 into the profile 10A and there is connected with the pressure/traction element. An angular area of the coupling member 24, extending out of the guide element 16 parallel to the window 22, makes
25 possible its connection with the window; for example, by gluing. Such a coupling member may be very short in the direction of movement, in particular, several such coupling members may be provided along the guide element 16. Advantages with respect to stability, however, are also possibly brought about by an oblong coupling member, extending along the guide element 16, which
30 member is connected with the window pane 22 along a greater or even the entire length of the guide element of the window.

Coupling members 24 may be components of the window pane 22 and connected with the pressure/traction element 20, which will be connected with the window pane 22, or they may be separate components which are or will be
5 connected with both the pressure/traction element and the window pane.

The characteristic feature of the example according to Figure 3, as compared with the preceding embodiments, consists in a different coupling member 24. This not only makes possible a drive connection between the pressure/traction
10 element 20 and the window 22 in the direction of raising and lowering, but also in the lateral direction of the window 22. While in the example according to Figure 5 an aligned arrangement of the window pane with respect to the window frame in the upper part of the window is possible while the window edge, abutting against the interior space of the door, requires a sill protruding
15 toward the exterior, it is possible according to the example of Figure 3 to realize a vehicle door in which the window pane and the parts of the exterior panel of the door adjacent to the window pane in its closed state can be aligned on all adjacent sides with the window 22, and accordingly, in the area of the sill as well.

20 For this purpose, the window pane 22, in the example according to Figure 3, is moved laterally by a lateral swiveling of the coupling members 24, out of its thrust position, which is aligned with the exterior panel, and is subsequently lowered into the interior space of the hollow door. The process is reversed
25 during the raising and subsequent closing of the window. This aspect of the invention is - also independent of a U-shaped profile bar - of independent significance.

30 Figure 8 shows an additional embodiment of a window arrangement and window guide element of a vehicle door that is possible to realize on a window frame above the interior space of the door, i.e. above the door sill without

sacrificing the quality of the guide element, the seal and/or strength of the window. In the case of the example shown in Figure 8, the coupling members 24 and oblong door profile components 10A are formed so as to correspond to each other and form along a predeterminable length, a good and also
5 comparatively tight window guidance element. Actually, it suffices when the coupling member 24 is located entirely inside the interior of the door, also when the window is closed, i.e. it does not extend into the glass area visible from the outside. However, it is also possible to arrange the coupling member 24 entirely or partially in the visible area of the window, i.e. when it is closed.
10 Such a window is particularly easy to install in the vehicle door from above. The coupling member 24 represents a reinforcement element of the window pane and may be glued, for example, on the glass of the window pane in a known way; for example, by means of polyurethane, or may be bonded with same by spraying along the edge of the window.

15 In the case of windows made of a deformable material, for example, polycarbonate or acrylic, the coupling member may also be a one-piece component of the window. The profile of the coupling member itself or a profile which has been altered in its cross section and which connects to the coupling
20 member may also surround the window pane (in its closed position) along its lateral as well as upper edge in order to achieve an increase in strength. In the same way, it is possible to shape the coupling member 24 by means of a shaping process or the like; for example, an exterior groove 30, in such a way that it can accommodate a window seal and/or, in the closed state, grip into
25 corresponding frame components of the vehicle body, thus giving to the window pane special support while in the completely closed state, particularly in its upper area. This is advantageous not only during high speeds, but also possibly as a protection against break-ins and for other reasons.

30 Also, the embodiment according to Figure 8 makes it possible to mount the window in such a way that, as viewed from the outside, it has a frameless

appearance. As can be seen on the right in Figure 8, next to the vehicle door shown in section on the left, another vehicle door or a vehicle body area may abut against a fixed window pane, wherein the adjacent window panes 22 are aligned with each other, leaving only a small crack. For the containment
5 support and possible movement of the window, similar structural components as with the vehicle door shown left in Figure 8, may be used.

It can be seen in Figure 6 that the means for moving the window; in particular, drive cables, also in the form of Bowden wires, can extend at least in part
10 outside the oblong profiles and/or may also be loosely placed inside the oblong profiles.

Figure 7 shows another vehicle door with a window-regulator arrangement of independent inventive significance, wherein typical Bowden controls (traction
15 element 20A), which are guided around deflection rolls or guide pulleys (deflection elements 20B) for the purpose of operating windows and are moved by a conventional window-regulator drive 18, are provided. The traction elements are connected to the window pane 22 by means of clamping devices or the like in a known manner. Here, a window-regulator arrangement of typical construction is involved. The characteristic feature in the embodiment according to Fig-
20 ure 7 consists in that the window-regulator guide elements are completely omitted because parallel profile bars 10A, 10E guide the parallel window edges which are facing each other, wherein these profiles form structural components of the door, particularly a frame structure 10, as described in connection with
25 the other examples.

5	10	frame structure
	10A	U-shaped profile bar
	10B	oblong profile
	10C	oblong profile
	10D	oblong profile
10	10E	oblong profile
	12	interior shell
	14	exterior shell
	16	window-operating guide element
	16A	groove
15	16B	edge guide element
	18	window-operating drive motor
	20	pressure/traction element
	20A	traction element
	20B	deflection roll
20	22	window pane
	24	coupling member
	26	interior door space
	28	connection means [bonding means]
	30	groove

Claims

1. Vehicle door, consisting of an interior shell (12) and a respective exterior shell (14) defining an interior space (26) of a door and further contains a frame structure (10); the lateral surfaces of the frame structure (10) are covered by at least one of the interior shell (12) and the respective exterior shell (14), characterized in that the frame structure (10) contains a profile bar (10A), forming at least part of a U-shaped structure as viewed from the side and opening towards an outer edge of the vehicle door and that said profile bar (10A) is provided with guide elements (16) for a window-regulator arrangement.
2. Vehicle door, in accordance with Claim 1, characterized in that said U-shaped structure is provided with a window-operating motor (18) or another window drive or adapted to receive such motor or drive.
3. Vehicle door, in accordance with Claim 2, characterized in that in the guide elements (16), drive cables, especially pressure and traction elements (20) of the window-regulator arrangement are integrated; said profile bar (10A) joins said motor or drive to a window pane (22) via said profile bar.
4. Vehicle door, in accordance with anyone of the Claims 1 to 3, characterized in that a raisable/lowerable window pane (22) is provided with coupling members (24) gripping into the guide elements (16).
5. Vehicle door, in accordance with Claim 4, characterized in that the coupling member (24) is glued to a window pane (22) of the door.

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6. Vehicle door, in accordance with Claim 4 or 5, characterized in that the coupling member (24) is formed to match with the window-regulator guide elements (16).
- 5 7. Vehicle door, in accordance with one of Claims 1 to 6, characterized in that several guide elements (16) are provided in an approximately parallel arrangement in said profile bar (10A) and serve to accommodate the drive elements of a raisable and lowerable window pane (22).
- 10 8. Vehicle door with window-regulator arrangement, in accordance with one of the Claims 1 to 7, characterized in that a window pane can be vertically raised and lowered as well as laterally moved, particularly into a closing position aligned with the exterior panel, and can be moved out of same into a raising and lowering position.
- 15 9. Vehicle door, in accordance with anyone of the Claims 1 to 8, characterized in that said profile bar (10A) consists of aluminum.
- 20 10. Vehicle door, in accordance with anyone of the Claims 1 to 9, characterized in that the same profiles which form the profile bar (10A) are provided on the side of the vehicle door as a support structure of the A-, B- and/or C-column.
- 25 11. Vehicle door, in accordance with anyone of the Claims 1 to 10, characterized in that said frame structure (10) is planked on both of its inner and outer surfaces by said inner shell (12) and said exterior shell (14) respectively.

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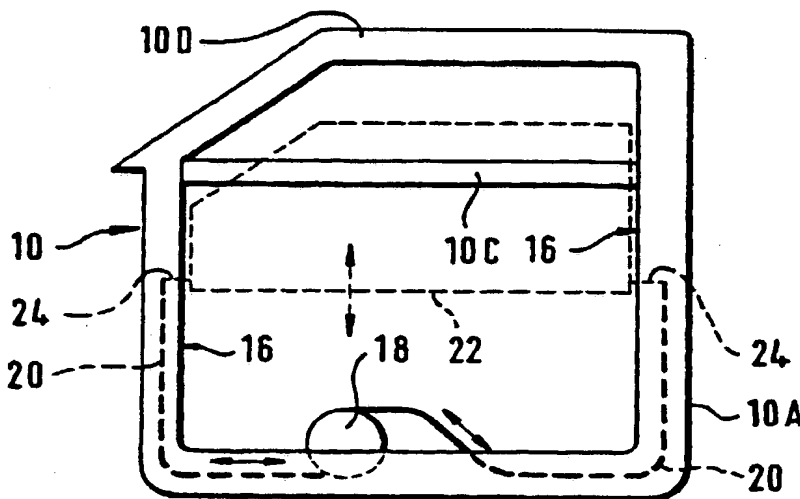
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[Continued on next page]

(54) Title: VEHICLE DOOR



(57) Abstract: A vehicle door, consisting of an interior shell and a respective exterior shell defining an interior space of a door on both sides and further contains a frame structure (10). the lateral surfaces of the frame structure (10) are covered by at least one of the interior shell and the respective exterior shell. In order to make this vehicle door comparatively lightweight but rigid while using parts of a window-regulator as structural parts of the vehicle door the frame structure consists at least in part of a profile bar (10A), bent into a U-shape as viewed from the side and opening to the top of the vehicle door. Said profile bar (10A) is provided with guide elements for a window-regulator arrangement.

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Fig. 1C

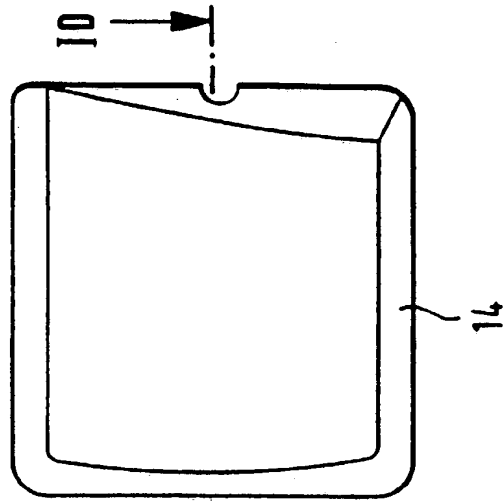


Fig. 1A

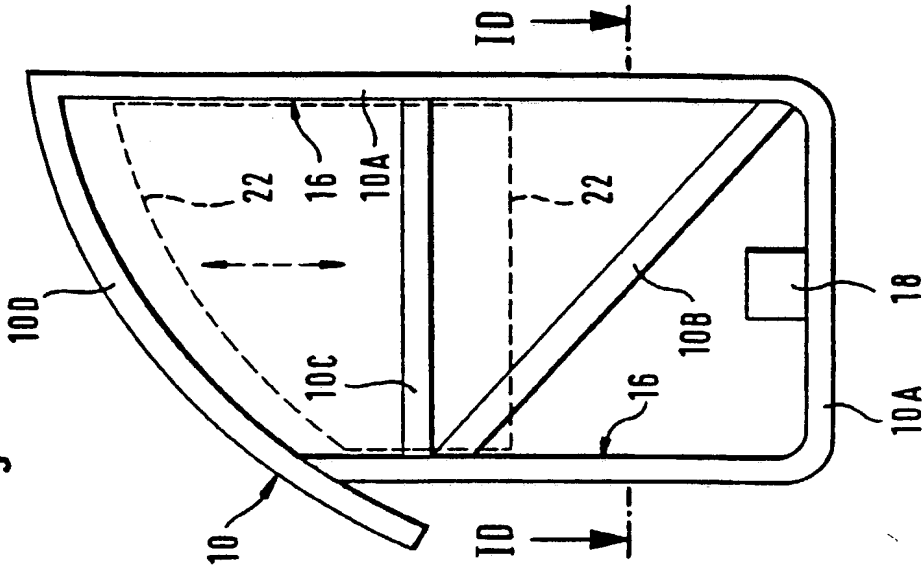
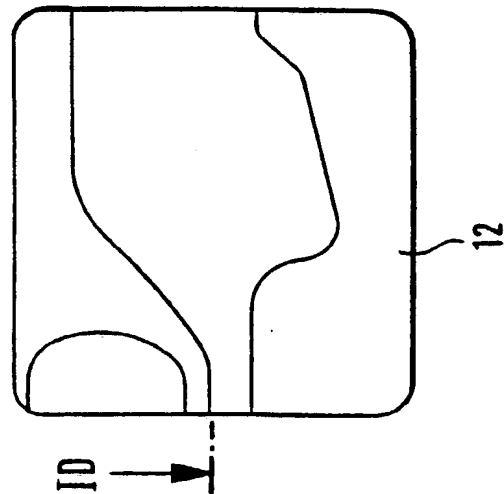


Fig. 1B



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Fig. 10

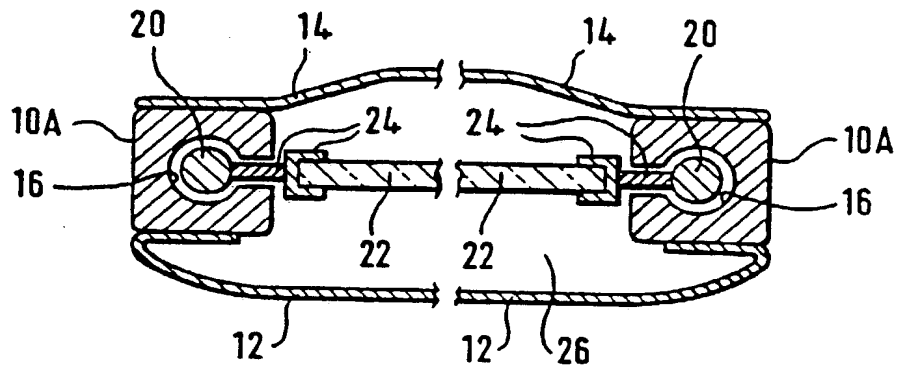


Fig. 2

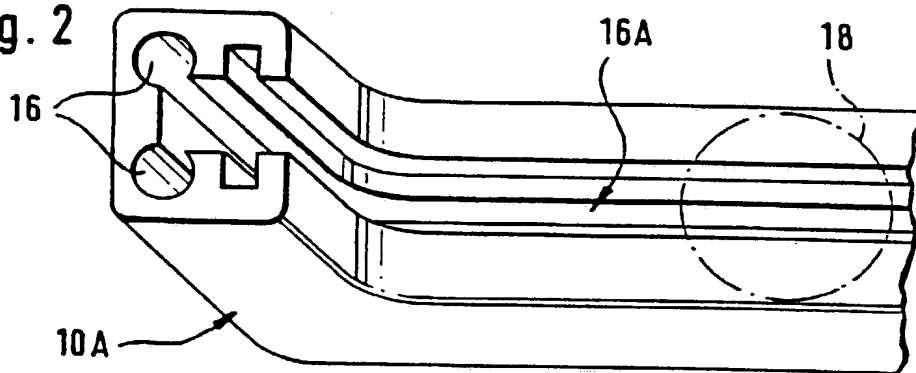


Fig. 3

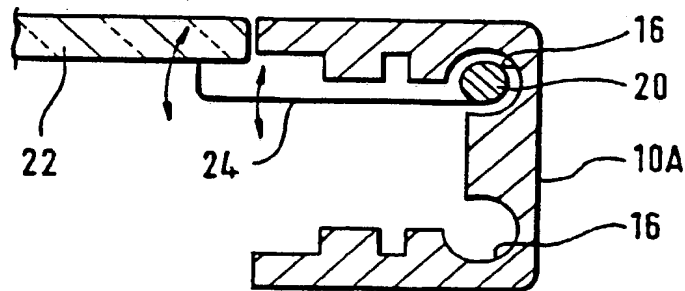


Fig. 4

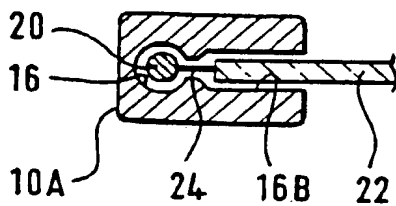


Fig. 5

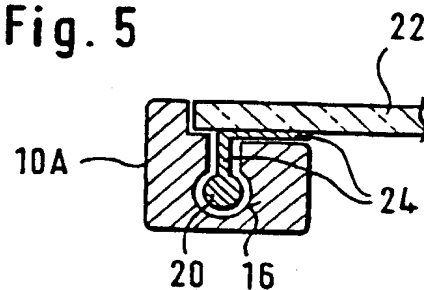


Fig. 6

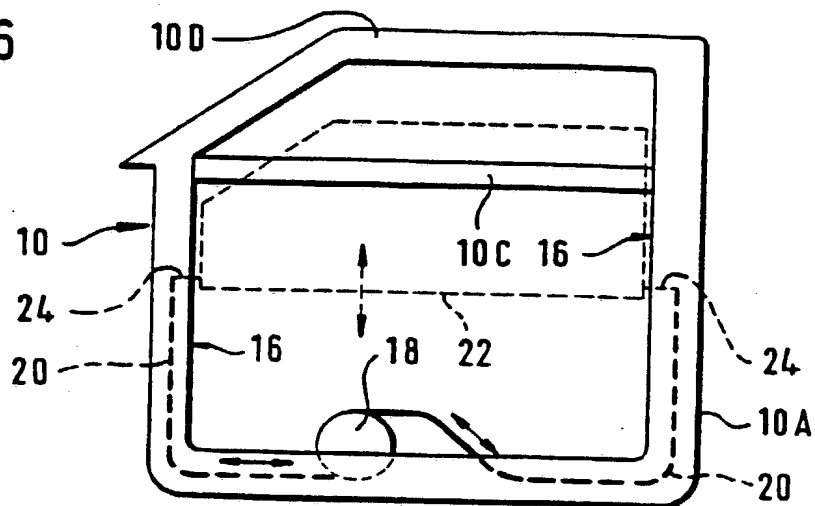


Fig. 7

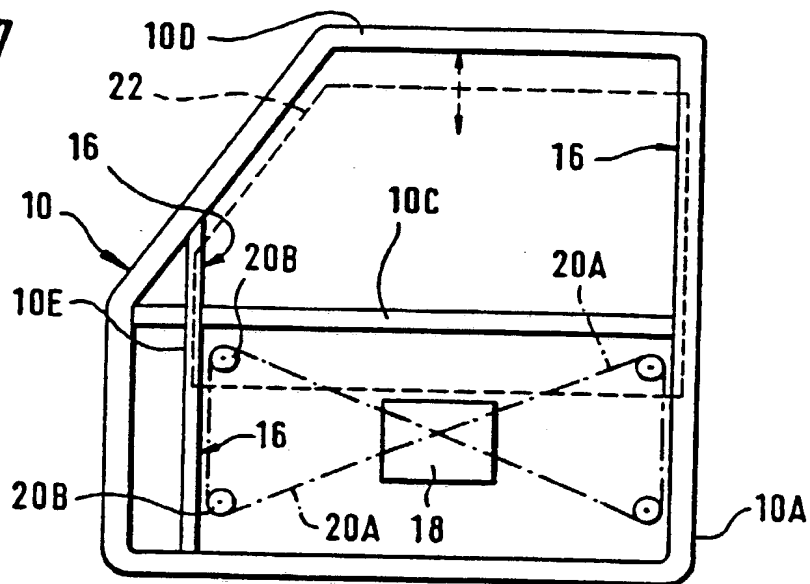
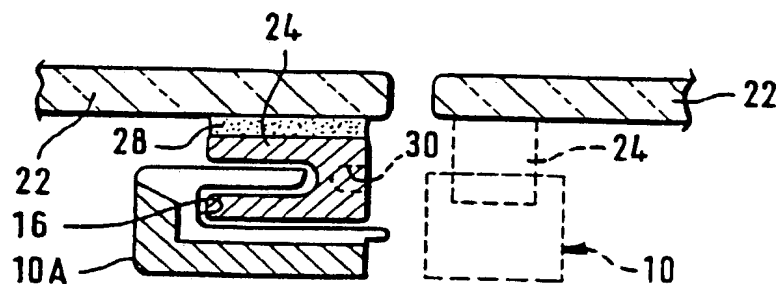


Fig. 8





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	Application Number	10 / 089,030
	Filing Date	March 26, 2002
	Group Art Unit	Unknown
	Examiner Name	Unknown

As a below named inventor, I hereby declare that:

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I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

VEHICLE DOOR

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 03/26/2002 as United States Application Number or PCT International (if applicable).

Application Number 10/089,030 and was amended on (MM/DD/YYYY) (if applicable).

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Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
PCT/EP00/09526	Europe	09/28/2000	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

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Inventor's
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DECLARATION — Utility or Design Patent Application

Direct all correspondence to: <input checked="" type="checkbox"/> Customer Number or Bar Code Label		026096		OR <input type="checkbox"/> Correspondence address below	
Name Karin H. Butchko					
Address 400 W. Maple Road					
Address Suite 350					
City Birmingham			State Michigan		ZIP 48009
Country United States		Telephone (248) 988-8360		Fax (248) 988-8363	
<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>					
NAME OF SOLE OR FIRST INVENTOR :			<input type="checkbox"/> A petition has been filed for this unsigned inventor		
Given Name (first and middle [if any]) Rainer			Family Name or Surname Grimm		
Inventor's Signature					Date
Residence: City Frankfurt		State	Country Germany		Citizenship
Mailing Address Sachsenhauser Landwehrweg 225					
Mailing Address					
City Frankfurt		State	ZIP D-60599	Country Germany	
NAME OF SECOND INVENTOR:			<input type="checkbox"/> A petition has been filed for this unsigned inventor		
Given Name (first and middle [if any]) Harald			Family Name or Surname Kollner		
Inventor's Signature <i>Harald Kollner</i>					Date 29/07.02
Residence: City Altenstadt		State	Country Germany		Citizenship Germany
Mailing Address Blutenweg 15					
Mailing Address					
City Altenstadt		State	ZIP D-63674	Country Germany	
<input checked="" type="checkbox"/> Additional inventors are being named on the <u>3</u> supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.					

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DECLARATION**REGISTERED PRACTITIONER
INFORMATION
(Supplemental Sheet)**

Name	Registration Number	Name	Registration Number
M. Lee Murrah	27,460		
Theodore W. Olds	33,080		
John E. Carlson	37,794		
David J. Gaskey	37,139		
Kerrie A. Laba	42,777		
William S. Gottschalk	44,130		
David L. Wisz	46,350		
Karin H. Butchko	45,864		
John M. Siragusa	46,174		
Anthony P. Cho	47,209		



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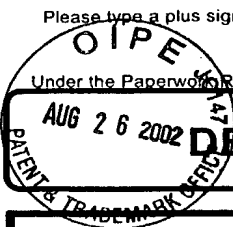
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DECLARATION

 ADDITIONAL INVENTOR(S)
 Supplemental Sheet
 Page 1 of 3

Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Klaus-Dieter		Strauss	
Inventor's Signature <i>Klaus-Dieter Strauss</i>		Date <i>July 21, 2002</i>	
Residence: City <i>Braunschweig</i>	State	Country <i>Germany</i>	Citizenship <i>Germany</i>
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Given Name (first and middle (if any))		Family Name or Surname	
Georg		Wurm	
Inventor's Signature		Date	
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Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Daniel		Drewniok	
Inventor's Signature		Date	
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Mailing Address <i>Rodheimer Strasse 11</i>			
Mailing Address			
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DECLARATION**ADDITIONAL INVENTOR(S)****Supplemental Sheet**Page 1 of 3**Name of Additional Joint Inventor, if any:**☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])

Family Name or Surname

Klaus-Dieter

Straub

Inventor's
Signature

Date

Residence: City Braunschweig

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Citizenship

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ZIP D-38110

Country Germany

Name of Additional Joint Inventor, if any:☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])

Family Name or Surname

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Wurm

Inventor's
Signature

Date 07/22/02

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Name of Additional Joint Inventor, if any:☐ A petition has been filed for this unsigned inventor

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Family Name or Surname

Daniel

Drewniok

Inventor's
Signature

Date 04/26/02

Residence: City Frankfurt

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Country Germany

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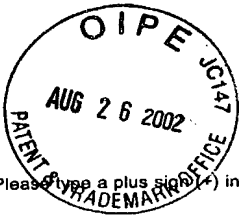
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ADDITIONAL INVENTOR(S)
Supplemental Sheet
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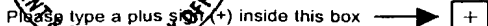
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DECLARATION**ADDITIONAL INVENTOR(S)****Supplemental Sheet**Page 2 of 3

Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
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Inventor's Signature		Date	
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Roderweg 24			
Mailing Address			
City	Baunach	State	ZIP
			D-96148
Country		Germany	
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any])		Family Name or Surname	
Patrick		Hof	
Inventor's Signature		Date	
760 [Signature]		DEX 22. 07. 2002	
Residence: City	Marburg	State	Country
			Germany
Mailing Address			
Eichgarten 14			
Mailing Address			
City	Marburg	State	ZIP
			D-35043
Country		Germany	
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor	
Given Name (first and middle [if any])		Family Name or Surname	
Simon Blair		Dobson	
Inventor's Signature		Date	
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5, the Corniche			
Mailing Address			
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Country		Great Britain	

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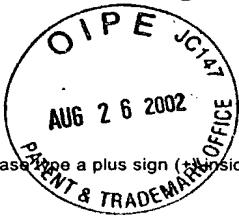
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ADDITIONAL INVENTOR(S)

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DECLARATION**ADDITIONAL INVENTOR(S)**
Supplemental Sheet
Page 3 of 3**Name of Additional Joint Inventor, if any:**☒ A petition has been filed for this unsigned inventor

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Family Name or Surname

Gregory

Keyes

Inventor's
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Date

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Citizenship

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Mailing Address

City Birmingham

State

ZIP B20 2LJCountry Great Britain**Name of Additional Joint Inventor, if any:**☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])

Family Name or Surname

Kenneth W

Schang

Inventor's
SignatureDate 17 July, 2002Residence: City PlymouthState MICountry USACitizenship USAMailing Address 46131 Academy

Mailing Address

City PlymouthState MIZIP 48170Country USA**Name of Additional Joint Inventor, if any:**☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])

Family Name or Surname

Inventor's
Signature

Date

Residence: City

State

Country

Citizenship

Mailing Address

Mailing Address

City

State

ZIP

Country

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